Building a Rangeland Decision Support System: Linking Ranges Products with DNDC, Phase I

Completed Technology Project (2005 - 2005)

Project Introduction

This proposal is submitted under the Innovative Tools and Techniques Supporting the Practical Uses of Earth Science Observations topic. We seek to evaluate and demonstrate technical approaches for linking remote sensing rangeland products with a soil biogeochemical model to form a decision support system for improved rangeland management. The resulting decision support system will be unique and innovative by not only providing operational remote sensing observations of rangeland condition, but also web-based tools that utilize these observations to provide critical information on soil fertility/productivity, greenhouse gas emissions, and potential erosion and sedimentation. Our Rangeland Decision Support System will build off of existing RANGES and DNDC tools. Landsat and MODIS prototype processing algorithms for rangeland condition (height, forage production, fractional cover) have been developed under the previous RANGES project. Our decision support system will couple RANGES products with the DeNtrification-DeComposition (DNDC) model. DNDC is a unique, spatially explicit, soil biogeochemical model that simulates both aerobic and anaerobic soil conditions, estimates crop yields based on a detailed crop physiology-phenology model, and is designed for assessing the net impact of alternative management on long-term soil organic carbon (SOC) dynamics and emissions of N2O, NO, CH4, and NH3 for upland and wetland agricultural ecosystems.

Anticipated Benefits

We anticipate our routine mapping and monitoring of rangeland products will be a very useful service to support USDA Risk Management Program needs for Risk Management Products for Pasture /Rangeland and forage systems as part of the USDA Federal Crop Insurance Corporation (FCIC). In addition, as the US EPA Total Maximum Daily Load criteria are set for rangeland watersheds, tools will be needed to map and monitor pollutant contributions across these watersheds. The RANGES products coupled with the information on C and N cycling and susceptibility to erosion and sedimentation will be extremely useful for the TMDL process.

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:
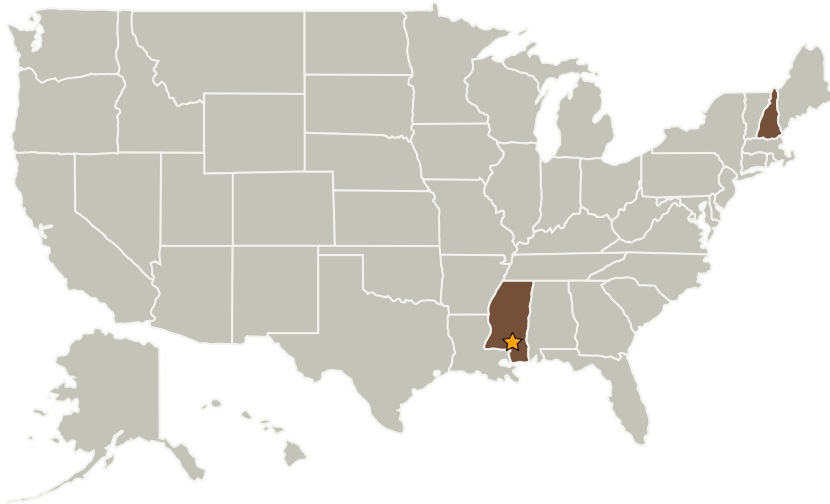
Stennis Space Center (SSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

For more information and an accessible alternative, please visit:
https://techport.nasa.gov/view/5129

Primary U.S. Work Locations and Key Partners

Organizations Performing Work	Role	Type	Location
⭐Stennis Space Center(SSC)	Lead Organization	NASA Center	Stennis Space Center, Mississippi
Applied Geosolutions, LLC	Supporting Organization	Industry	Durham, New Hampshire

Primary U.S. Work Locations	
Mississippi	New Hampshire

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

Jim Anderson

Principal Investigator:

William Salas

Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  └ TX11.5 Mission Architecture, Systems Analysis and Concept Development
      └ TX11.5.2 Tools and Methodologies for Performing Systems Analysis